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M/035/002

**Kennecott**

December 6, 2001



Mr. Doug Bacon
Utah Department of Environmental Quality
Department of Environmental Response and Remediation
168 North 1950 West
P.O. Box 144840
Salt Lake City, Utah 84114-4840

RE: Additional Responses to October 11, 2001, Letter Regarding Kennecott Utah Copper Corporation's final *South Facilities Groundwater Remedial Design Work Plan*

Dear Mr. Bacon,

This letter is provided in response to your letter of October 11, 2001 to clarify outstanding questions regarding the South Facilities Groundwater Remedial Design Work Plan. Your comments from the October 11 letter are shown in italic font followed by Kennecott's response. Many of these questions were discussed during the TRC meeting on October 30, 2001. Hopefully this letter will address any outstanding questions you might have.

Comments and Responses:

**Specific Comments on the Revised Remedial Design Work Plan:**

*(1) Page 7, Section 1.4 Nature and Extent of Contamination – Bingham Creek Reservoir Area, 1st paragraph, 3rd sentence: The average concentrations for the metal contaminants in the Bingham Creek plume should be compared to minimum and maximum concentrations. Average concentrations generally do not allow the reader to judge the severity of the problem. Including at least the maximum concentration, the reader is presented a clearer picture as to the extent of contamination and is provided a basis to evaluate the severity of contamination. Please address.*

The intent Section 1.4 *Nature and Extent of Contamination* is to give a brief summary and provide context for the Remedial Design. It is not meant to be a comprehensive

definition of the nature and extent of contamination in the South Jordan Valley. That was the purpose of the Remedial Investigation and why the Remedial Investigation was referenced in the first sentence of Section 1.4. All of the information you have requested so that "*the readier is presented a clearer picture as to the extent of contamination and is provided a basis to evaluate the severity of contamination*" is documented in the Remedial Investigation. All of the members of the TRC, including all government agencies, have been provided a copy of the Remedial Investigation and should use the document for more detailed information about the nature and extent of contamination.

*(2) Page 7, Section 1.4 Nature and Extent of Contamination – Bingham Creek Reservoir Area, 1st paragraph: Please list the metal contaminants that exceed the secondary drinking water standards. UDERR recognizes that the secondary drinking water standards were created for standardizing the aesthetic nature of the water that is supplied to the public and to enhance the treatability of the water prior to primary treatment. However, a listing of the secondary standards would assist the water users in the area to understand the project requirements that need to be met at the treatment plants. The metals aluminum, iron, manganese and zinc all exceed their secondary drinking water standards and should be noted as so.*

Similar to the previous response, the purpose of the work plan is to provide the technical basis, plans and schedules by which Kennecott will prepare a Final Remedial Design to address groundwater contamination at Kennecott's South Facilities. A detailed discussion regarding the nature and extent of contamination can be found in the Remedial Investigation Report. Specifically, Table 4-1 in the Remedial Investigation presents Primary and Secondary Drinking Water Standards compared to Table 4-8 in the Remedial Investigation which presents "Summary Statistics for Mining-Affected Groundwater". None of the other reviewers requested this information, therefore, it was assumed that they obtained the information from the Remedial Investigation or did not think it was required to be included in this section of the Remedial Design Work Plan.

*(3) Page 9, Section 1.4 Nature and Extent of Contamination – Bingham Creek Reservoir Area, 2nd paragraph, 4th sentence: Please explain the basis for the determination of the 1500 mg/l (milligram per liter) sulfate contour line and its significance.*

The 1500 mg/L sulfate contour line is a standard point of reference when defining sulfate concentration contours of the groundwater plume. See, Section 1.8 of the March 16, 1998 Feasibility Study for Kennecott Utah Copper South Facilities Groundwater Plume, Southwestern Jordan Valley, Utah; As noted in the Record of Decision for the Southwest Jordan River Valley Ground Water Plumes, one of the Remedial Action Objectives is to "contain the acid plume and keep it from expanding and . . . maintain sulfate-laden ground water in excess of 1500 mg/l west of the Kennecott property line in Zone A." See, December 13, 2000 Record of Decision, Kennecott South Zone OU2, Southwest Jordan River Valley Ground Water Plumes, Part 2, Section G – Summary of Site Risks, Section H – Remedial Action Objectives, and Table "Final Cleanup Levels for the Selected Remedy."

*(4) Page 10, Section 1.4 Nature and Extent of Contamination – Former KUCC (South Jordan) Evaporation Ponds Area, 1st paragraph, 4th sentence: Please provide a table that presents the concentrations of the contaminants of concern (COCs) detected in Zone B. The reference to the SMI report of 1996 explaining how KUCC decided that the metal contamination in Zone B is not from mining wastes disposed of in the old evaporation ponds should be explained in more detail in the text of the RDWP.*

These data are not necessary for the purpose of the Remedial Design Work Plan. If the reader needs to know this information it is available in the Remedial Investigation.

*(5) Page 10, Section 1.4 Nature and Extent of Contamination – Former KUCC (South Jordan) Evaporation Ponds Area, 2nd paragraph, 3rd sentence: Please provide the maximum and minimum concentrations for sulfate and total dissolved solids (TDS) in Zone B. As stated previously in comment #1, the inclusion of the maximum concentrations will allow the reader to understand the severity of the contamination in Zone B.*

Please see all of the responses above. This information is available in the Remedial Investigation Report.

*(6) Page 10, Section 1.4 Nature and Extent of Contamination - Lark Area, and Page 10, Section 1.4 Nature and Extent of Contamination – KUCC Eastside Collection System Area: Please provide a table similar to Table 1-1, for the contaminants and their exceedances in these areas.*

Please see all of the responses above. This information is available in the Remedial Investigation Report.

*(7) Page 10, Section 1.4 Nature and Extent of Contamination – KUCC Eastside Collection System Area, 1st paragraph, 4th sentence: The Eastside Collection System has a total of twenty-four cutoff walls, of which the Division of Water Quality (DWQ) has stated only one or two of the walls ever have water reporting to the collection pipe. Please explain where the meteoric water is traveling (i.e., bedrock infiltration). Please explain how the water escaping the collection system is not considered a source of contamination. If contaminated ground water in the bedrock aquifer is traveling under the collection system to the valley aquifer, please explain the impact on the potential time frame for cleanup, of the valley aquifer.*

The Eastside Collection System (ECS) is designed to capture water perched on the bedrock/waste rock contact as it discharges from the toe of the waste rock dumps. This water is then piped out of the area so it cannot re-infiltrate into the alluvium and bedrock down-gradient from the dump toe. The cutoff walls are located in drainages down-gradient from these surface collection systems and are designed to capture any flow on the bedrock/alluvium contact that may have escaped the collection systems at the base of

the dumps. The fact that almost all of the cutoff walls are dry confirms that the collection systems at the toe of the dumps are working properly.

Recent studies by the University of Utah (Solomon et al. 2001) confirm that the majority of water that percolates through the waste rock dumps perches at the waste rock/bedrock contact and discharges from the dump toe where it is currently collected. The study also found that a small percentage of the contact water passes through the bedrock/waste rock contact and reaches the regional water table. Once this water reaches the regional water table it travels to the east beneath the ECS and is not captured. The cessation of active leaching has greatly reduced the amount of water that is traveling through the waste rock/bedrock contact. As shown in a recent study by Borden (2001) the majority of contamination observed in down-gradient wells is related to losses from the pre-ECS collection system. This contaminant transport pathway was removed when the system was upgraded between 1993 and 1996 and on average the water quality in the down-gradient wells is now improving. The average sulfate concentration in the alluvial operational and compliance wells associated with the ECS groundwater discharge permit has declined from about 6000 mg/L in 1993 to less than 2000 mg/L today. Kennecott anticipates continued reductions in the sulfate levels of the alluvial wells as clean water recharges the system in the future.

*(8) Page 17, Table 1-2 Summary of Preliminary Failure Modes and Effects Analysis: Treatment of Water-Treatment Concentrates in KUCC Tailings Circuit, Failure Mode #3: Please provide the long-term mitigation action in case the tailings circuit is not able to adequately control the chemistry of the water. The mitigation method should be at least outlined so the agencies have some assurances for corrective action.*

As described in the TRC meeting on October 30, 2001, a minimum pH of 6.8 must be maintained in the tailings line in order for effluent from the tailings impoundment to meet UPDES Permit UTD0000051 concentration limits. Regardless of whether acid plume water is added to the tailings line or not, this minimum pH must be maintained. If the acidic water begins to lower the pH in the tailings line, supplemental lime will be added to maintain a pH greater than 6.8. In the long term, a stand-alone lime treatment system will be constructed to treat the acidic water.

*(9) Page 18, Table 1-2 Summary of Preliminary Failure Modes and Effects Analysis: Treatment of Water-Treatment Concentrates in KUCC Tailings Circuit, Failure Mode #5: Please provide the long-term mitigation option in case the tailings acidify in the tailings line. The mitigation method should be at least outlined so the agencies have some assurances for corrective action.*

See previous response.

*(10) Page 25, Table 3-1 Extraction Rates for the Proposed Remedial Strategy: Pursuant to the table in the RDWP, the barrier well system comprises of two wells, K109 and B2G1193. In reviewing the RD sub-work plan for the monitoring activities there are more wells slated for pumping and containing the sulfate portion of the plume. Please*

*clarify the amount of wells that will be incorporated into the barrier well system and accurately account for the wells between documents. Please explain the effectiveness the proposed amount of wells will be to contain the plume.*

The wells listed on Page 25, Table 3-1 are the correct wells for the proposed remedial strategy. The Baseline Groundwater Monitoring sub-work plan indicates only B2G1193 and K109 as sulfate plume extraction locations and the current acid well (ECG1146) area as acid plume extraction, with the future addition of more acid extraction wells implied. We think you may be referring to the reference in the sub-work plan for the need to monitor around the Lark Clean Water Well (LTG1139) "...where supplemental water for plume treatment may be obtained..." (page 11, section 4.2.4 of the monitoring sub-work plan). It will be sulfate extraction. Water from the Lark well, which is greater than 250 ppm sulfate may be used as a source of water that will be sent to the RO facility for treatment with other sulfate contaminated water sources to meet the volume requirements of the clean-up action. One of the purposes of the monitoring plan is to establish baseline conditions so that the impacts of future extraction from the aquifers involved in remedial action, for whatever reason, may be examined. The comparison of the baseline data to data obtained after remediation begins will be used to determine "the effectiveness" of the containment and extraction system.

The other possible point of confusion in the monitoring sub-work plan is that on the table where the sampling rational is listed for each monitoring well (table 3, pg 15 of the monitoring sub-work plan), there are 11 wells that have "SO4 extraction" listed as the monitoring rational, two of which are K109 and B2G1193. The other nine wells are monitoring wells, not extraction wells. Please refer to Plate 2 in the Monitoring Plan where the extraction wells and monitoring wells are identified with different symbols and correspond to the extraction plan shown in Table 3-1 of the RDWP.

*(11) Page 34, Section 3.7 Technical Approach, Item #5. UDERR reiterates the need to coordinate with the Division of Solid and Hazardous Waste before implementing this post-closure management alternative for the treatment concentrates. As stated in the SWJV Record of Decision (State ARARs Table), post-mine closure concentrate disposal options would have to meet the guidelines for disposal based upon the chemical nature of the concentrate stream. EPA did not designate whether the waste stream would meet certain exempting criteria, but deferred it for a later discussion. Please address.*

Kennecott agrees that it is too early at this time to make any decisions regarding post mining concentrate disposal. That is why a Preliminary Post Closure Water Management Plan will be developed as part of the Final Remedial Design. No action will be taken regarding post mining concentrate disposal without full communication and cooperation of the many different agencies that have an interest in this issue.

*(12) Page 37, Section 4.2.3 Land Use Restrictions. Please explain further if KUCC intends to place covenants and restrictions primarily on the property and water rights the corporation owns or request assistance from the Division of Water Rights (DWR) in placing the same restrictions upon abutting water right holders. Please explain if similar*

*restrictive clauses will be placed on the deed for the KUCC property in Zone B. Please address the concerns raised by DWR in reference to potential impact upon other water right holders in the vicinity of the proposed extractions and the appropriate level of compensation that may be applied.*

Based on recent meetings with the State Engineer and Director of the Utah Department of Environmental Quality, Kennecott will work cooperatively with the State Engineer and the largest water right holders in the area to try and minimize or stop continually decreasing aquifer water levels in the region. In addition, KUCC will impose drilling restrictions on KUCC owned land in areas where new wells might interfere with or expand the contamination in the groundwater. To the extent the land is not owned by KUCC, the State Engineer's assistance is necessary.

**Specific Comments on the Response Letter from KUCC, dated August 3, 2001:**

*(1) Page 7, Response #13 of the Response Letter. UDERR recognizes that natural variability does affect the distribution of acidic water. However, the wastewater that was sent to the South Jordan Evaporation Ponds varied in quality because of the processes it was derived from. The localized points in the aquifer that are somewhat acidic not only are affected by natural variability (i.e., lithological layers and soil chemistry), but could also be affected by the quality of discharge water and the seepage rate from the ponds. Please address for clarification.*

The waste water sent to the Evaporation Ponds may have affected acidic portions of the aquifer located down gradient from the Ponds. However, for those downgradient groundwaters containing less than 250 - 500 mg/L sulfate, it is unlikely that the low pH was due to Evaporation Pond seepage because the waste water entering the ponds would have had sulfate concentration ranging from 5 to 500 times higher than the downgradient groundwater. We feel that the first response gave possible answers to the original question and that we should not try to produce a finite answer for a hydro-dynamic system.

Sincerely,

Jon Cherry, P.E.
Senior Project Engineer

Enclosure

cc: Dr. Eva Hoffman, U. S. Environmental Protection Agency Region VIII
Daniel Hall, Utah Division of Water Quality
Jarred Manning, Utah Department of Natural Resources/Division of Water Rights